

Date: Thu, 26 Aug 93 04:30:34 PDT
From: Ham-Space Mailing List and Newsgroup <ham-space@ucsd.edu>
Errors-To: Ham-Space-Errors@UCSD.Edu
Reply-To: Ham-Space@UCSD.Edu
Precedence: Bulk
Subject: Ham-Space Digest V93 #14
To: Ham-Space

Ham-Space Digest Thu, 26 Aug 93 Volume 93 : Issue 14

Today's Topics:

 * SpaceNews 23-Aug-93 *
 ANS-233 BULLETINS
 ARLK032 Keplerian data
 ORBS\$233.2liners

Send Replies or notes for publication to: <Ham-Space@UCSD.Edu>
Send subscription requests to: <Ham-Space-REQUEST@UCSD.Edu>
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Ham-Space Digest are available
(by FTP only) from UCSD.Edu in directory "mailarchives/ham-space".

We trust that readers are intelligent enough to realize that all text
herein consists of personal comments and does not represent the official
policies or positions of any party. Your mileage may vary. So there.

Date: 20 Aug 93 20:04:45 GMT
From: sdd.hp.com!vixen.cso.uiuc.edu!howland.reston.ans.net!gatech!destroyer!
nntp.cs.ubc.ca!alberta!nebulus!adec23!usenet@network.ucsd.edu
Subject: * SpaceNews 23-Aug-93 *
To: ham-space@ucsd.edu

SB NEWS @ AMSAT \$SPC0823
* SpaceNews 23-Aug-93 *

BID: \$SPC0823

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SpaceNews
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MONDAY AUGUST 23, 1993

SpaceNews originates at KD2BD in Wall Township, New Jersey, USA. It is published every week and is made available for unlimited distribution.

* NASA NEWS *

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Presently workers at the Kennedy Space Center are continuing to prepare Space Shuttle Endeavour for the STS-61 mission. They plan to install the 5th cryogenic tank set and perform main propulsion system leak and functional checks. Completed work on the orbiter includes ammonia boiler checks and orbital maneuvering system functional checks.

On Monday, August 30, 1993 and continuing through September 1, the Johnson Space Center will host a workshop for news media. The workshop will familiarize reporters with the training and operations leading up to the first servicing mission of the Hubble Space Telescope. The STS-61 mission is slated to launch in early December.

The 3 day workshop will include briefings on mission preparation and round-robin interviews with the 7-member crew. The mission preparation and overview briefings will be carried on NASA TV.

Hubble's servicing mission is scheduled to last 11 days and include several space walks. The mission will conclude with a landing at the Kennedy Space Center.

[Info via NASA]

* POSAT-1 NEWS *

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POSAT-1 -- POSSIBLE OPPORTUNITIES FOR AMATEUR EXPERIMENTATION

PoSAT-1 was built at the University of Surrey by SSTL staff and a team of 4 engineers seconded from Portuguese industry. PoSAT-1 has been built as a technology-transfer project between SSTL and a consortium of Portuguese aerospace companies. The satellite carries an Earth imaging camera, a CCD Star sensor, a Trimble GPS receiver and a digital signal processing experiment with TMS320C25 and TMS320C30 processors. Of course, the standard on-board computer supporting standard PACSAT protocols is also provided.

Surrey is negotiating with the Portuguese industrial consortium for PoSAT to operate in the amateur bands part time (its primary mission is outside the amateur bands). Part time amateur access would allow standard UoSAT-OSCAR-22 equipped stations to receive pictures from the camera and data from the GPS experiment. It is also possible to provide high speed modulation through the DSP system, which will allow radio amateurs to develop the necessary RF and

digital techniques to go beyond 9600 bits/second.

The PoSAT camera has the same optics as the KITSAT-A camera, but since PoSAT is twice as close to the Earth as KITSAT, resolution will be doubled. The narrow-angle camera should produce 200 meter resolution! Standard PACSAT Broadcast Protocol techniques will be used to download the images.

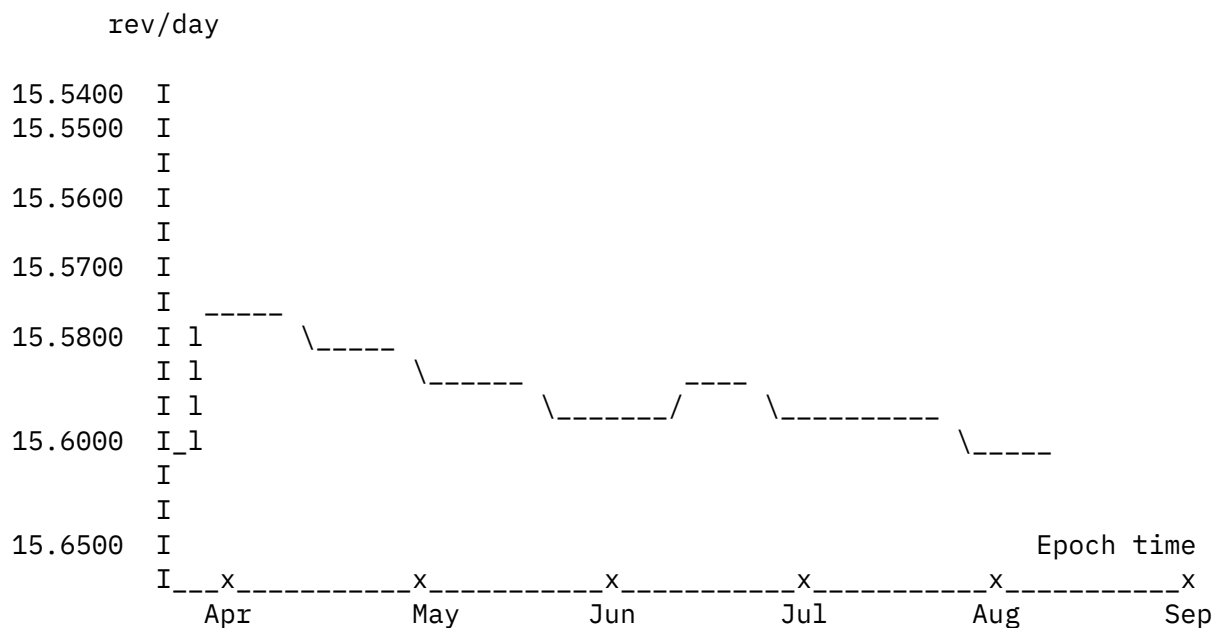
[Info via Jeff Ward, K8KA/G0SUL at the University of Surrey UoSAT Unit]

★ MIR NEWS ★

=====

The following graph by Jean-Claude, FB1RCI depicts Mir's orbital mean motion (the number of perigee crossings per day) as a function of time. Keep in mind that mean motion is a function of altitude. The greater the satellite's altitude, the lower the mean motion.

Time revolution summary for the MIR Complex object 16609
(Period= day 79 to day 216 1993)



Orbit adjustments were performed on March 22, and June 17 during this study.

[Info via Jean-Claude, FB1RCI]

★ PERSEIDS REPORT ★

=====

The following group of HAMS from Maryland travelled up to SKYLINE DRIVE to

observe the Perseids on Aug 11-12. They stopped at BIG MEADOWS (mile 51) on the drive and saw a great show! It was an average year as far as number of meteors, running about 40 or so an hour from 9 PM (11th) until 1:30 on the 12th. Skies were clear with excellent viewing conditions. There were a large number of very bright meteors this year, over 36 that went halfway across the sky and left very large smoke trails. The large number of "bright meteors" has led some to believe that we missed the core of the stream and went through the edge of the stream where we encountered a number of large fragments that had not been reduced to smaller dust type meteors, i.e. lack of collisions with their neighbors in the stream. The hams on hand were: WA3TAI, WA3ZII, N3OZM, KA3ZPA, KB3AGF and N3CAM, all members of the Southern Maryland Amateur Radio Club.

[Info via Larry, N3CAM]

* THANKS! *

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Thanks to all those who sent messages of appreciation regarding SpaceNews, especially:

7Z2YB K6DGW

* FEEDBACK/INPUT WELCOMED *

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Mail to SpaceNews should be directed to the editor (John, KD2BD) via any of the following paths:

FAX : 1-908-747-7107
UUCP : ...catfish.ocpt.ccur.com!ka2qhd!kd2bd
PACKET : KD2BD @ NN2Z.NJ.USA.NA
INTERNET : kd2bd@ka2qhd.ocpt.ccur.com -or- kd2bd@amsat.org

MAIL : John A. Magliacane, KD2BD
Department of Engineering and Technology
Advanced Technology Center
Brookdale Community College
Lincroft, New Jersey 07738
U.S.A.

<<= SpaceNews: The first amateur newsletter read in space! -=>>

/EX

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John A. Magliacane, KD2BD * /\ \ * Voice : 1-908-224-2948
Advanced Technology Center |/\ \ \ | Packet : KD2BD @ NN2Z.NJ.USA.NA

Brookdale Community College |\\|\\|\\| Internet: kd2bd@ka2qhd.ocpt.ccur.com
Lincroft, NJ 07738 * \\|\\| * Morse : -.- -.. ..--- -... -..

Date: 22 Aug 93 18:17:23 GMT
From: destroyer!nntp.cs.ubc.ca!alberta!adec23!usenet@uunet.uu.net
Subject: ANS-233 BULLETINS
To: ham-space@ucsd.edu

SB SAT @ AMSAT \$ANS-233.01
MORE INFO ABOUT OSCARS

HR AMSAT NEWS SERVICE BULLETIN 233.01 FROM AMSAT HQ
SILVER SPRING, MD AUGUST 21, 1993
TO ALL RADIO AMATEURS BT
BID: \$ANS-233.01

KITSAT-B: First Independently Built Korean Satellite

AMSAT-NA would like to correct a bulletin a few weeks ago with respect to KITSAT-B. The KITSAT-B satellite was NOT built at the Univeristy of Surrey but at the Korean Advanced Institute of Science and Technology (KAIST). The satellite was built entirely in Korea using an all-Korean team. Members of this team were trained at Surrey and built KITSAT-A (now known as UO-22) at Surrey; however KITSAT-B is a completely Korean effort. This independent effort is considered to be an important phase in the educational "technology transfer" between Surrey and KAIST.

POSAT-1: Possible Opportunities For Amaetur Experimentation

PoSAT-1 was built at Surrey by SSTL staff and a team of 4 engineers seconded from Portugese industry. PoSAT-1 has been built as a technology-transfer project between SSTL and a consortium of Portugese aerospace companies. The satellite carries an Earth imaging camera, a CCD Star sensor, a Trimble GPS receiver and a digital signal processing experiment with TMS320C25 and TMS320C30 processors. The standard on-board computer supporting standard PACSAT protocols will also be provided.

Although its primary mission is outside the amateur bands, Surrey is negotiating with the Portugese industrial consortium for PoSAT to operate in the amateur bands part ot the time. Such part time amateur access would allow standard UoSAT-OSCAR-22 equipped stations to receive pictures from the camera and data from the GPS experiment. It is also possible to provide high speed modulation through the DSP system, which will allow radio amateurs to develop the necessary RF and digital techniques to go beyond 9600 baud.

The PoSAT camera has the same optics as the KITSAT-A camera, but since PoSAT is to be at half of the altitude of KITSAT, resolution should be doubled. The narrow-angle camera should produce 200 meter resolution. Standard PACSAT Broadcast Protocol techniques will be used to download the images. The amateur community will be kept informed as negotiations with the Portugese Consortium continue. Mail from radio amateurs who think they might be interested in receiving PoSAT-1 in the amateur bands would be appreciated and might help in conducting these discussions. Please send your comments and suggestions to the following address:

Jeff Ward, K8KA/G0SUL
Surrey Satellite Technology
University of Surrey UoSAT Unit
Guildford, Surrey GU2 5XH
England

Or via Internet: k8ka@AMSAT.org

[The AMSAT News Service (ANS) would like to thank Jeff Ward K8KA/G0SUL for the information used in this bulletin.]

/EX

SB SAT @ AMSAT \$ANS-233.02
PHASE-3D STATUS REPORT

HR AMSAT NEWS SERVICE BULLETIN 233.02 FROM AMSAT HQ
SILVER SPRING, MD AUGUST 21, 1993
TO ALL RADIO AMATEURS BT
BID: \$ANS-233.02

WD4FAB Provides Latest Phase-3D Status Report & Request For Assistance

Dick Jansson (WD4FAB) AMSAT-NA VP for Engineering, reports that the assembly of the Engineering Structural Model for Phase 3-D is now nearing completion in Germany. As many of you know, Dick, along with a team from Weber State University, has been working on this critical task for the past month with Dr. Karl Meinzer (DJ4ZC) and Werner Haas (DJ5KQ) of AMSAT-DL. Their goal has been to confirm the form, fit and function of structural designs for the new satellite. Dick says that the effort has been a tremendous learning experience for all. It has also given everyone involved a much clearer vision of where and how we must proceed in the months to come in order to be ready for launch in 1996.

As this stage of the development draws to a successful close, and as a direct result of the process, Dick now foresees that some additional, and immediate, machining expertise for the spacecraft thermal structure will be required beyond that already being expertly provided by our Weber State University people. He's asked that an urgent request be made for some

additional help with machining some of the structural parts for the spacecraft.

Anyone with "hands on" machining experience, particularly in the milling and fine finishing of metal parts, and who also has both the spare time and use of facilities to donate to the Phase-3D cause are welcome to volunteer. Anyone who would like to help, or knows of someone who can, please contact Dick Jansson (beginning August 24th) at (407) 644-9008, or fax him at (407) 644-9782.

[The AMSAT News Service (ANS) would like to thank Dick Daniels (W4PUJ) for the information used in this bulletin.]

/EX

SB SAT @ AMSAT \$ANS-233.03
AMSAT OPS NET SCHEDULE

HR AMSAT NEWS SERVICE BULLETIN 233.03 FROM AMSAT HQ
SILVER SPRING, MD AUGUST 21, 1993
TO ALL RADIO AMATEURS BT
BID: \$ANS-233.03

Current AMSAT Operations Net Schedule For A0-13

AMSAT Operations Nets are planned for the following times. Mode-B Nets are conducted on A0-13 on a downlink frequency of 145.950 MHz. If, at the start of the OPS Net, the frequency of 145.950 MHz is being used for a QSO, OPS Net enthusiasts are asked to move to the alternate frequency of 145.955 MHz

Date	UTC	Mode	Phs	NCS	Alt NCS
28-Aug-93	1830	B	157	WJ9F	VE2LVC
11-Sep-93	0730	B	159	VE2LVC	W9ODI
18-Sep-93	1515	B	96	N7NQM	W5IU

Any stations with information on current events would be most welcomed. Also, those interested in discussing technical issues or who have questions about any particular aspect of OSCAR statellite operations are encouraged to join the OPS Nets. In the unlikely event that either the Net Control Station (NCS) or the alternate do not call on frequency, any participant is invited to act as the NCS.

Slow Scan Television on A0-13

SSTV sessions will be held on immediately after the OPS Nets a downlink on

a Mode-B downlink frequency 145.960 MHz.

/EX

SB SAT @ AMSAT \$ANS-233.04

WEEKLY OSCAR STATUS REPORTS

HR AMSAT NEWS SERVICE BULLETIN 233.04 FROM AMSAT HQ

SILVER SPRING, MD AUGUST 21, 1993

TO ALL RADIO AMATEURS BT

BID: \$ANS-233.04

Weekly OSCAR Status Reports: 21-AUG-93

A0-13: Current Transponder Operating Schedule:

L QST *** A0-13 TRANSPONDER SCHEDULE *** 1993 Aug 14-Oct 25

Mode-B : MA 0 to MA 60 !

Mode-BS : MA 60 to MA 120 !

Mode-S : MA 120 to MA 145 !<- Mode-S transponder; B transponder is OFF

Mode-S : MA 145 to MA 150 !<- Mode-S beacon only

Mode-BS : MA 150 to MA 210 ! Blon/Blat 180/0

Mode-B : MA 210 to MA 256 !

Omnis : MA 170 to MA 15 ! Move to attitude 210/0 25-Oct-1993

Continuous up-to-date information about A0-13 operations is always available on the beacons at 145.812 MHz and 2400.646 MHz in CW, RTTY and 400 bps PSK. Also, these bulletins are also posted to INTERNET, ANS bulletins, Packet, PACSATs, etc., and can also be found in many international newsletters. [G3RUH/DB20S/VK5AGR]

RS-10: WB2WPA reports excellent results at his QTH with RS-10. He notes that he has worked 12 states and a number of VE provinces in casual operating over the past few weeks. He installed an Advanced Receiver Research (ARR) 10M preamp, and he saw his signals rise to S-9+. Also, WB2WPA has seen good "over-the-horizon" results for about 1 minute before AOS and after LOS recently running 80 watts to a 15 element beam with horizontal polarization. Also, WC9C reports that the RS-10 transponder is working just fine. With the Solar Flux dropping below 100, Mode-A signals even during the day light hours are fairly strong. The transponder activity was very high last week with at least 3 DX stations heard. There was no message on the telemetry beacon this week, and the CW Robot was also working just fine. [WB2WPA & WC9C]

RS-12: GM4IHJ has been copying RS-12 well into the evenings in the UK while it is "sub-horizon" at the terminator over UA0. He notes that it is well worth the time for RS-12 operators to be looking for the satellite long before AOS and long after LOS and even on "out of range" passes to the north. If you can hear the 29.407 MHz beacon the chances are that the satellite transponder will hear your 21.210 - 21.250 MHz uplink. WC9C reports that RS-12 Mode-K transponder is working fine with lots of activ-

ity. With 15M dropping off as the solar flux falls, he says that there is alot less interference to the Mode-K uplink passband. At the end of the telemetry frame there was this test message which said: "Test test test RS3X QTH Kaluga" [GM4IHJ/G3IOR & WC9C]

A0-16: Operating normally. [WH6I]

U0-22: Operating normally. [WH6I]

K0-23: Operating normally. [WH6I]

The AMSAT NEWS Service (ANS) is looking for volunteers to contribute weekly OSCAR status reports. If you have a favorite OSCAR which you work on a regular basis and would like to contribute to this bulletin, please send your observations to WD0HHU at his CompuServe address of 70524,2272, on INTERNET at wd0hhu@amsat.org, or to his local packet BBS in the Denver, CO area, WD0HHU @ W0LJF.#NECO.CO.USA.NOAM. Also, if you find that the current set of orbital elements are not generating the correct AOS/LOS times at your QTH, PLEASE INCLUDE THAT INFORMATION AS WELL. The information you provide will be of value to all OSCAR enthusiasts.

/EX

Date: Mon, 16 Aug 1993 23:11:12 GMT
From: noc.near.net!howland.reston.ans.net!sol.ctr.columbia.edu!news.kei.com!
news.oc.com!spssig.spss.com!feenix.metronet.com!marcbg@uunet.uu.net
Subject: ARLK032 Keplerian data
To: ham-space@ucsd.edu

SB KEP @ ARL \$ARLK032
ARLK032 Keplerian data

ZCZC SK44
QST de W1AW
Keplerian Bulletin 32 ARLK032
>From ARRL Headquarters
Newington, CT August 15, 1993
To all radio amateurs

SB KEP ARL ARLK032
ARLK032 Keplerian data

Thanks to NASA, AMSAT and N3FKV for the following Keplerian data.

Decode 2-line elsets with the following key:

1 AAAAAU 00 0 0 BBBB.BBBBBBBB .CCCCCCCC 00000-0 00000-0 0 DDDZ

2 AAAAA EEE.EEEE FFF.FFFF GGGGGGG HHH.HHHH III.IIII JJ.JJJJJJJJ KKKKKKZ
KEY: A-CATALOGNUM B-EPOCHTIME C-DECAY D-ELSETNUM E-INCLINATION F-RAAN
G-ECCENTRICITY H-ARGPERIGEE I-MNANOM J-MNMOTION K-ORBITNUM Z-CHECKSUM

AO-10

1 14129U 83058 B 93221.06889999 -.00000019 99999-4 0 154
2 14129 27.0868 11.8398 6022186 104.2478 326.2403 2.05882066 48381

RS-10/11

1 18129U 87054 A 93220.43284199 0.00000088 89554-4 0 6381
2 18129 82.9203 199.9896 0011538 165.4463 194.6995 13.72321524307019

UO-11

1 14781U 84021 B 93215.16055773 0.00000214 40399-4 0 4271
2 14781 97.8101 239.4802 0010858 202.8016 157.2703 14.69034577503614

RS-12/13

1 21089U 91007 A 93219.09473796 0.00000019 13296-4 0 4120
2 21089 82.9222 244.3622 0027716 264.3337 95.4657 13.74025097125519

AO-13

1 19216U 88051 B 93217.59545340 0.00000151 20473-2 0 6281
2 19216 57.8256 301.8379 7222206 321.1899 4.8410 2.09717933 7891

UO-14

1 20437U 90005 B 93218.73957688 0.00000038 22824-4 0 7604
2 20437 98.6130 302.4541 0011877 37.2541 322.9463 14.29785557184656

AO-16

1 20439U 90005 D 93218.73756346 0.00000033 20735-4 0 5651
2 20439 98.6207 303.3807 0012226 38.3084 321.8965 14.29844227184667

DO-17

1 20440U 90005 E 93218.79218351 0.00000031 20010-4 0 5674
2 20440 98.6211 303.6596 0012298 37.9561 322.2477 14.29980426184683

WO-18

1 20441U 90005 F 93219.25219564 0.00000031 19859-4 0 5695
2 20441 98.6209 304.1374 0012876 36.3969 323.8080 14.29959852184752

LO-19

1 20442U 90005 G 93219.25085967 0.00000038 22703-4 0 5660
2 20442 98.6211 304.3215 0013238 35.7691 324.4369 14.30050311184762

FO-20

1 20480U 90013 C 93213.62679476 -.00000013 15582-6 0 4527
2 20480 99.0320 61.1953 0541077 343.7838 14.6522 12.83220426163149

AO-21

1 21087U 91006 A 93222.78919451 0.00000084 82656-4 0 8245
2 21087 82.9432 12.4120 0034219 228.0928 131.7291 13.74523258126944

UO-22

1 21575U 91050 B 93219.08053576 0.00000062 27770-4 0 2653
2 21575 98.4703 294.3668 0007975 140.7748 219.4029 14.36842996107973

KO-23

1 22077U 92052 B 93220.36901674 0.00000000 99999-4 0 1101
2 22077 66.0839 214.9336 0001040 164.0942 196.0109 12.86279781 46558

Mir

1 16609U 86017 A 93223.12589245 0.00007296 94354-4 0 2310

2 16609 51.6212 303.5868 0004074 325.5769 34.4921 15.59173182427701

Keplerian bulletins are transmitted twice weekly from W1AW.
The next scheduled transmission of these data will be Tuesday,
August 17, 1993, at 2230z on Baudot, AMTOR and ASCII.

NNNN

/EX

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Marc B. Grant, N5MEI | marchbg@feenix.metronet.com | 214/231-3998 (voice)
P.O Box 850472 | marchbg@esy.com | 214/231-0025 (fax)
Richardson, TX 75085 |

Date: 21 Aug 93 05:00:21 GMT
From: pravda.sdsc.edu!news.cerf.net!usc!sol.ctr.columbia.edu!destroyer!
nntp.cs.ubc.ca!alberta!adec23!usenet@network.ucsd.edu
Subject: ORBS\$233.2liners
To: ham-space@ucsd.edu

SB KEPS @ AMSAT \$ORBS-233.N
2Line Orbital Elements 233.AMSAT

HR AMSAT ORBITAL ELEMENTS FOR AMATEUR SATELLITES IN NASA FORMAT
FROM N3FKV HEWITT, TX August 21, 1993
BID: \$ORBS-233.N

DECODE 2-LINE ELSETS WITH THE FOLLOWING KEY:

1 AAAAAU 00 0 0 BBBB.BBBBBBBB .CCCCCCC 00000-0 00000-0 0 DDDZ
2 AAAAA EEE.EEEE FFF.FFFF GGGGGGG HHH.HHHH III.IIII JJ.JJJJJJJKKKKKZ
KEY: A-CATALOGNUM B-EPOCHTIME C-DECAY D-ELSETNUM E-INCLINATION F-RAAN
G-ECCENTRICITY H-ARGPERIGEE I-MNANOM J-MNMOTION K-ORBITNUM Z-CHECKSUM

TO ALL RADIO AMATEURS BT

A0-10

1 14129U 83 58 B 93231.75179754 -.000000065 00000-0 99999-4 0 211
2 14129 27.0569 10.1473 6021794 107.1044 324.1194 2.05882262 76574

U0-11

1 14781U 84 21 B 93223.60658007 .000000198 00000-0 37632-4 0 4287
2 14781 97.8094 247.5503 0011577 173.9570 186.1778 14.69038330504856

RS-10/11

1 18129U 87 54 A 93229.83827171 .000000088 00000-0 89554-4 0 6401
2 18129 82.9234 193.0392 0012481 139.9196 220.2871 13.72321881308304
AO-13
1 19216U 88 51 B 93226.17818333 -.000000104 00000-0 20752-2 0 6325
2 19216 57.8443 300.3381 7221606 321.8002 4.7665 2.09725131 39572
FO-20
1 20480U 90 13 C 93225.78913214 -.000000014 00000-0 -31207-5 0 4533
2 20480 99.0306 71.0468 0540659 316.2348 39.7057 12.83220466164708
AO-21
1 21087U 91 6 A 93231.81561965 .000000084 00000-0 82656-4 0 8298
2 21087 82.9426 5.7317 0034611 202.3434 157.6192 13.74523755128180
RS-12/13
1 21089U 91 7 A 93229.07106723 .000000017 00000-0 11162-4 0 4132
2 21089 82.9219 236.9625 0027660 234.9376 124.9185 13.74025364126881
ARSENE
1 22654U 93 31 B 93220.71127607 -.000000049 00000-0 99999-4 0 198
2 22654 1.1442 124.5650 2935408 146.5525 234.2699 1.42202880 1323
UO-14
1 20437U 90 5 B 93231.26605416 .000000047 00000-0 25969-4 0 7622
2 20437 98.6123 314.8397 0011366 2.8372 357.2872 14.29787542186447
AO-16
1 20439U 90 5 D 93231.26352572 .000000035 00000-0 21509-4 0 5672
2 20439 98.6190 315.7747 0011719 3.1468 356.9786 14.29846065186451
DO-17
1 20440U 90 5 E 93231.24698108 .000000040 00000-0 23273-4 0 5698
2 20440 98.6203 315.9886 0011881 2.7769 357.3478 14.29982418186460
WO-18
1 20441U 90 5 F 93231.70717307 .000000036 00000-0 21472-4 0 5710
2 20441 98.6201 316.4658 0012362 1.8628 358.2599 14.29961627186532
LO-19
1 20442U 90 5 G 93231.70504863 .000000040 00000-0 23226-4 0 5682
2 20442 98.6204 316.6519 0012713 1.0517 359.0693 14.30052236186547
UO-22
1 21575U 91 50 B 93231.75449411 .000000051 00000-0 24349-4 0 2678
2 21575 98.4693 306.8326 0008484 106.0767 254.1336 14.36845142109798
KO-23
1 22077U 92 52 B 93231.33196579 -.000000000 00000-0 99999-4 0 1113
2 22077 66.0824 191.9814 0000444 137.4733 222.6319 12.86279631 47965
NOAA-9
1 15427U 84123 A 93231.78366715 .000000099 00000-0 62853-4 0 4416
2 15427 99.0967 273.0498 0015292 352.8514 7.2451 14.13539534447766
NOAA-10
1 16969U 86 73 A 93231.76299227 .000000070 00000-0 38002-4 0 2837
2 16969 98.5142 244.8897 0013905 126.3373 233.9093 14.24828078359681
MET-2/17
1 18820U 88 5 A 93232.28298461 .000000053 00000-0 42440-4 0 8792
2 18820 82.5464 147.9442 0016147 312.2366 47.7421 13.84691111280711
MET-3/2

1 19336U 88 64 A 93232.23669589 .000000043 00000-0 99999-4 0 532
 2 19336 82.5426 176.6306 0016008 298.8112 61.1449 13.16960545243640
 NOAA-11
 1 19531U 88 89 A 93231.83247056 .00000117 00000-0 73529-4 0 1929
 2 19531 99.1371 208.9043 0010875 261.3666 98.6298 14.12907284252669
 MET-2/18
 1 19851U 89 18 A 93231.97362886 .000000026 00000-0 18224-4 0 8175
 2 19851 82.5176 24.0587 0014436 357.8314 2.2781 13.84341635226019
 MET-3/3
 1 20305U 89 86 A 93232.20619064 .000000043 00000-0 99999-4 0 7262
 2 20305 82.5531 119.7202 0016132 321.9262 38.0719 13.16022429183523
 MET-2/19
 1 20670U 90 57 A 93232.09090408 -.000000005 00000-0 -93519-5 0 5697
 2 20670 82.5462 87.6397 0014684 275.8136 84.1357 13.84178452158969
 FY-1/2
 1 20788U 90 81 A 93229.94982459 -.00000184 00000-0 -11051-3 0 6159
 2 20788 98.8591 254.4701 0016811 133.3562 226.9008 14.01294476151237
 MET-2/20
 1 20826U 90 86 A 93230.95013143 .000000032 00000-0 23706-4 0 5739
 2 20826 82.5225 26.4432 0012759 168.8617 191.2828 13.83556036145962
 MET-3/4
 1 21232U 91 30 A 93230.45642473 .000000043 00000-0 99999-4 0 3928
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 2 21655 82.5514 330.6565 0012248 238.6146 121.3757 13.16822784 96598
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 1 22739U 93 50 A 93230.54120631 -.000000471 00000-0 -25277-3 0 169
 2 22739 98.9098 171.7273 0008895 253.5930 106.4339 14.10846522 1283
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 1 16609U 86 17 A 93231.45771588 .00007206 00000-0 92737-4 0 2469
 2 16609 51.6185 261.7152 0004581 1.4840 358.5862 15.59314826429005
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1 21701U 91 63 B 93223.65499224 -.00002546 00000-0 -21356-3 0 2532
2 21701 56.9833 319.1315 0004184 93.3539 266.8018 14.96217004104605
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1 22161U 92 64 A 93232.25259642 .00000159 00000-0 98830-4 0 1468
2 22161 62.9981 333.7799 0772166 288.5116 63.3570 13.21655334 42025
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